IN THE CLAIMS:

1. (currently amended): A circuit element having a first layer composed of an electrically insulating substrate material, comprising:

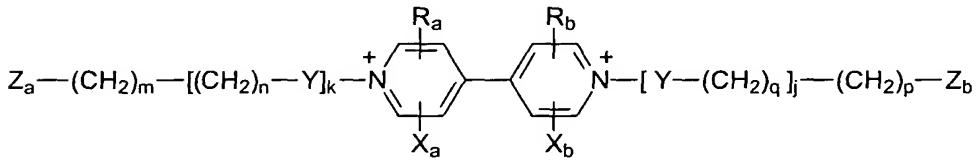
[[•]] ~~having~~ a first electrically conductive material, which is in the form of at least one discrete area such that it is embedded in the substrate material and[[/or]] is applied to the substrate material[[,]] ;

[[•]] a second layer having a second electrically conductive material[[,]] ; and

[[•]] a monomolecular layer composed of redox-active bispyridinium molecules, which is arranged between the first layer composed of the electrically insulating substrate material and the second layer with the second electrically conductive material, with the bispyridinium molecules in the monomolecular layer being immobilized on the electrically conductive material which is in the form of at least one discrete area, and with bispyridinium molecules in the monomolecular layer making electrical contact with the second electrical material of the second layer, [[and]] wherein

[[•]] ~~in which~~ electrically inert molecules are immobilized on the first layer which is composed of the electrically insulating substrate material, and which molecules form a matrix which surrounds the at least one discrete area with the monomolecular layer composed of bispyridinium molecules.

2. (currently amended): The circuit element as claimed in claim 1, <u>further comprising</u> ~~in which~~ the bispyridinium molecules <u>being two-aromatic-ring</u> [[are]] compounds with the general formula (I),



wherein in formula (I),

<u>at least one</u> ~~one or more~~ of the carbon atoms of the two aromatic ring systems of the bispyridinium unit can be replaced independently of one another by at least one grouping $X_a$ [[or]] <u>and</u> $X_b$ which in each case represents a heteroatom which is <u>selecting from the group consisting of</u> ~~chosen from~~ S, N, [[and]] O[[,]] <u>and</u> ~~or which represents~~ a blank[[,]] ;

<u>at least one</u> ~~one or more~~ of the carbon atoms of the two ring systems may, in each case independently of one another, have a substituent $R_a$ [[or]] <u>and</u> $R_b$ ~~which in each case independently represents~~ <u>selected from the group consisting of</u> alkyl, aryl, alkylaryl, alkenyl, alkynyl, halogen, CN, OCN, NCO, COOH, COOR', CONHR', $NO_2$, OH, OR', $NH_2$, NHR', NR'R", SH and SR', wherein R' and R" [[may]] <u>is selected from the group consisting of</u> ~~independently of one another be~~ alkyl, aryl, alkylaryl, alkenyl [[or]] <u>and</u> alkynyl[[, or]] ;

~~wherein $R_a$ and $R_b$ may together form a bridge between the two aromatic ring systems, which bridge comprises 1 to 3 atoms, wherein the atoms are chosen independently of one another from C, S, N and O, and may be linked to one another by a single, double or triple bond and, furthermore, may have a substituent $R_e$, with the substituent $R_e$ having the meaning indicated above for $R_a$ and $R_b$;~~

Y <u>is selected from the group consisting of</u> ~~represents a group which can be chosen independently of one another from~~ $CH_2$, O, S, NH, NR', COO, CONH, CH=CH, C≡C [[or]] <u>and</u> aryl[[,]] ;

$Z_a$ and $Z_b$ ~~may in each case independently of one another be~~ are selected from the group consisting of $CH_3$, -CH=$CH_2$, SH, -S-S-, -C(CO)$CH_3$, $SiCl_3$, $Si(OR)_3$, $SiR(OR')(OR'')$, $SiR(OR')_2$, $Si(R'R'')NH_2$, COOH, $SO_3$, $PO_3H$ [[or]] and $NH_2$, wherein R' and R'' ~~may each independently of one another be~~ are selected from the group consisting of alkyl, aryl, arylalkyl, alkenyl [[or]] and alkynyl[[,]] ; and

wherein n[[,]] and q may in each case independently of one another assume a value between 0 and 12,

j and k may in each case independently of one another assume a value between 0 and 6, and

p and m may in each case independently of one another assume a value between 0 and 12.

3. (original): The circuit element as claimed in claim 1 or 2, in which the electrically inert molecules are compounds with a long-chain alkyl residue.

4. (original): The circuit element as claimed in claim 3, in which the inert molecules have a head group by means of which they are covalently bonded to the first layer which is composed of the electrically insulating substrate material.

5. (currently amended): The circuit element as claimed in claim 4, in which the inert molecules are alkylsilyl compounds with the general formula

$CH_3$-$(CH_2)_p$-$SiR_1R_2R_3$ (II),

wherein in formula (II) p represents an integer between 1 and 30, ~~preferably 1 and 20,~~ and wherein $R_1$, $R_2$ and $R_3$ ~~may independently of one another be~~ are selected from the group consisting of hydrogen, halogen, OR', NHR', and NR'R'', and wherein ~~where~~ R' and R'' is equally alkyl.

6. (currently amended): The circuit element as claimed in claim 1, ~~in which~~ further comprising a plurality of discrete areas which are composed of the first electrically conductive material are embedded in the substrate material and[[/or]] are applied to the substrate material.

7. (currently amended): The circuit element as claimed in claim 1, in which the first electrically conductive material is selected from the group consisting of gold, silver palladium, platinum and [[or]] silicon.

8. (currently amended): The circuit element as claimed in claim 1, in which the layer which is composed of the second electrically conductive material comprises titanium and[[/or]] aluminum.

9. (currently amended): The circuit element as claimed in claim 1, ~~in which~~ further comprising the first electrically conductive material and the second electrically conductive material [[are]] being in the form of electrodes.

10. (currently amended): The circuit element as claimed in claim 9, ~~which is~~ further comprising the circuit element being a memory element.

11. (currently amended): The circuit element as claimed in claim 10, ~~which is~~ further comprising the circuit element being a nonvolatile memory.

12. (currently amended): A method for producing a circuit element, ~~in which~~ comprising:

[[•]] providing a layer composed of an insulating substrate material; ~~is provided,~~

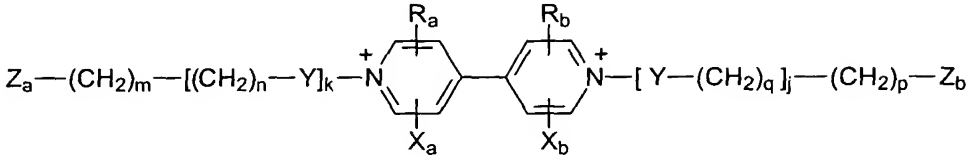
[[•]] embedding a first electrically conductive material ~~is embedded~~ in the substrate material and[[/or]] is applied to the substrate material at at least one discrete position[[,]];

[[•]] immobilizing redox-active bispyridinium molecules ~~are immobilized~~ as monomolecular layer on the at least one discrete area which is composed of the first electrically conductive material[[,]];

[[•]] immobilizing electrically inert molecules ~~are immobilized~~ on the first layer which is composed of the electrically insulating substrate material, whereby the electrically inert molecules form a matrix which surrounds the at least one area with the monomolecular layer composed of bispyridinium molecules[[,]]; and

[[•]] applying a second layer with a second electrically conductive material ~~is applied~~ to the layer composed of the electrically inert molecules and the bispyridinium molecules, whereby the bispyridinium molecules in the monomolecular layer make contact with the second electrical material of the second layer.

13. (currently amended): The method as claimed in claim 12, in which compounds with the general formula (I)



are used as bispyridinium molecules, wherein in the formula (I),

~~one or more~~ at least one of the carbon atoms of the two aromatic ring systems of the bispyridinium unit can be replaced independently of one another by at least one grouping $X_a$ [[or]] and $X_b$ which in each case represents a heteroatom which is ~~chosen from~~ selected from the group S, N, [[and]] O[[,]] ~~or which represents~~ and a blank,

~~one or more~~ consisting of at least one of the carbon atoms of the two ring systems may, in each case independently of one another, have a substituent $R_a$ [[or]] and $R_b$ selected from the group consisting of ~~which in each case independently represents~~ alkyl, aryl, alkylaryl, alkenyl, alkynyl, halogen, CN, OCN, NCO, COOH, COOR', CONHR', $NO_2$, OH, OR', $NH_2$, NHR', NR'R", SH and SR', wherein R' and R" [[may]] are selected from the group consisting of ~~independently of one another be~~ alkyl, aryl, alkylaryl, alkenyl [[or]] and alkynyl; ~~, or~~

~~wherein $R_a$ and $R_b$ may together form a bridge between the two aromatic ring systems, which bridge comprises 1 to 3 atoms, wherein the atoms are chosen independently of one another from C, S, N and O, and may be linked to one another by a single, double or triple bond and, furthermore, may have a substituent $R_e$, with the substituent $R_e$ having the meaning indicated above for $R_a$ and $R_b$;~~

Y is selected from the group consisting of ~~represents a group which can be chosen independently of one another from~~ $CH_2$, O, S, NH, NR', COO, CONH, CH=CH, C≡C [[or]] and aryl[[,]] ;

$Z_a$ and $Z_b$ are selected from the group consisting of ~~may in each case independently of one another be~~ $CH_3$, -CH=$CH_2$, SH, -S-S-, -C(CO)$CH_3$, $SiCl_3$, $Si(OR)_3$, SiR(OR')(OR"), $SiR(OR')_2$, Si(R'R")$NH_2$, COOH, $SO_3$, $PO_3H$ [[or]] and $NH_2$, where R' and R" are selected from the group consisting of ~~may each independently of one another be~~ alkyl, aryl, arylalkyl, alkenyl [[or]] and alkynyl[[,]] ; and

wherein n, q may in each case independently of one another assume a value between 0 and 12,

j and k may in each case independently of one another assume a value between 0 and 6, and

p and m may in each case independently of one another assume a value between 0 and 12.

14. (original): The method as claimed in claim 12 or 13, in which compounds with a long-chain alkyl residue are used as electrically inert molecules.

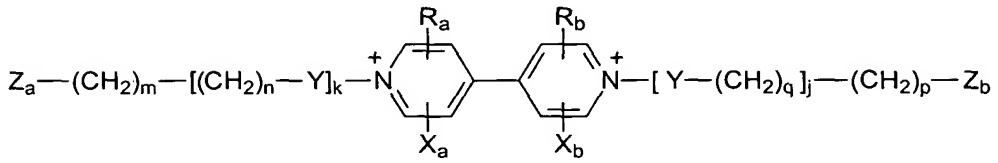
15. (original): The method as claimed in claim 12, in which gold is used as the first conductive material.

16. (original): The method as claimed in claim 12, in which the first electrically conductive material is embedded in and[[/or]] is applied to the substrate material in a regular pattern.

17. (original): The method as claimed in claim 12, in which the second electrical material is vapor-deposited onto the layer composed of the electrically inert molecules and the bispyridinium molecules.

18. (original): The method as claimed in claim 17, in which ~~titanium and/or aluminum are/is used as~~ the second electrically conductive material is selected from the group consisting of titanium and aluminum.

19. (currently amended): A bispyridinium compound having the general formula (Ib)



wherein in formula (Ib)

at least one ~~one or more~~ of the carbon atoms of the two aromatic ring systems of the bispyridinium unit can be replaced independently of one another by at least one grouping $X_a$ [[or]] and $X_b$ which in each case represents a heteroatom which is chosen from S, N and O, or which represents a blank,

at least one ~~one or more~~ of the carbon atoms of the two ring systems, in each case independently of one another, has a substituent $R_a$ [[or]] and $R_b$ ~~which in each case independently represents~~ are selected from the group consisting of alkyl, aryl, alkylaryl, alkenyl, alkynyl, halogen, CN, OCN, NCO, COOH, COOR', CONHR', $NO_2$, OH, OR', $NH_2$, NHR', NR'R", SH and SR', wherein R' and R" ~~may independently of one another~~ are selected from the group consisting of [[be]] alkyl, aryl, alkylaryl, alkenyl [[or]] and alkynyl[[, or]] ;

~~wherein $R_a$ and $R_b$ together form a bridge between the two aromatic ring systems, which bridge comprises 1 to 3 atoms, wherein the atoms are chosen independently of one another from C, S, N and O, and may be linked to one another by a single, double or triple bond and, furthermore, may have a substituent $R_e$, with the substituent $R_e$ having the meaning indicated above for $R_a$ and $R_b$;~~

Y represents a group ~~which can be chosen independently of one another from~~ selected from the group consisting of $CH_2$, O, S, NH, NR', COO, CONH, CH=CH, C≡C[[or]] and aryl[[,]] ;

$Z_a$ and $Z_b$ ~~may in each case independently of one another be~~ are selected from the group consisting of $CH_3$, -CH=$CH_2$, SH, -S-S-, $SiCl_3$, $Si(OR)_3$, SiR(OR')(OR"), $SiR(OR')_2$, Si(R'R")$NH_2$, Si($R_2$')$NH_2$, COOH, $SO_3$, $PO_3H$ [[or]] and $NH_2$, wherein R' and R" are selected from the group consisting of ~~may each independently of one another be~~ alkyl, aryl, arylalkyl, alkenyl [[or]] and alkynyl[[,]] ; and

wherein n[[,]] and q may in each case independently of one another assume a value between 0 and 12,

j and k may in each case independently of one another assume a value between 0 and 6, and

p and m may in each case independently of one another assume a value between 0 and 12, with the following compounds being excluded:

N,N'-dimethyl-4,5,9,10-tetrahydro-2,7-diazapyreniumdiiodide;

1,1',2,2'-tetramethyl-4,4'-bispyridinium;

1,1',2-trimethyl-4,4'-bispyridinium;

N,N'-dimethyl-2,7-diazapyrenium;

N-methyl-N'-(p-toloyl)-2,7-diazapyrenium,

1,1'-dimethyl-2-phenyl-6-(p-toloyl)-4,4'-bispyridiniumdiperchlorate;

1,1'-dimethyl-2-phenyl-4,4'-bispyridiumdiperchlorate;

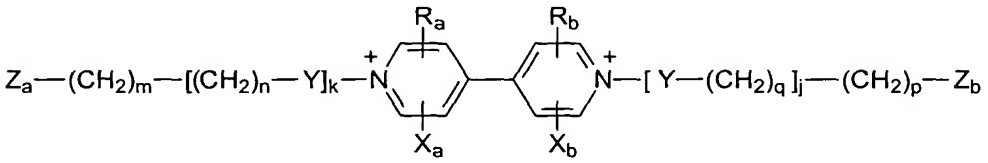
6-(phenyl)-1,1',2-trimethyl-4,4'-bispyridiumdiperchlorate; and

1,1'-dimethyl-2-phenyl-6-(2,5-dichloro-3-thienyl)-4,4'-bispyridiumdiperchlorate.

20. (currently amended): Use of bispyridinium compounds having the general formula (I) ~~or (Ib)~~ as a functional unit in memory units.

21. (new): Use of bispyridinium compounds having the general formula (Ib) as a functional unit in memory units.

22. (new): The circuit element as claimed in claim 1, further comprising the bispyridinium molecules being two-aromatic-ring compounds with the general formula (I),



wherein in formula (I),

at least one of the carbon atoms of the two aromatic ring systems of the bispyridinium unit can be replaced independently of one another by at least one grouping $X_a$ and $X_b$ which in each case represents a heteroatom which is selecting from the group consisting of S, N, and O and a blank;

at least one of the carbon atoms of the two ring systems may, in each case independently of one another, have a substituent $R_a$ and $R_b$ wherein $R_a$ and $R_b$ may together form a bridge between the two aromatic ring systems, which bridge comprises 1 to 3 atoms, wherein the atoms are chosen independently of one another from C, S, N and O, and may be linked to one another by a single, double or triple bond and, furthermore, may have a substituent $R_c$, with the substituent $R_c$ having the meaning indicated above for $R_a$ and $R_{b[[,]]}$ ;

Y is selected from the group consisting of $CH_2$, O, S, NH, NR', COO, CONH, CH=CH, C≡C and aryl;

$Z_a$ and $Z_b$ are selected from the group consisting of $CH_3$, -CH=$CH_2$, SH, -S-S-, -C(CO)$CH_3$, $SiCl_3$, $Si(OR)_3$, SiR(OR')(OR"), $SiR(OR')_2$, Si(R'R")$NH_2$, COOH, $SO_3$, $PO_3H$ and $NH_2$, wherein R' and R" are selected from the group consisting of alkyl, aryl, arylalkyl, alkenyl or alkynyl[[,]] ; and

wherein n and q may in each case independently of one another assume a value between 0 and 12,

j and k may in each case independently of one another assume a value between 0 and 6, and

p and m may in each case independently of one another assume a value between 0 and 12.

23. (new): The circuit element as claimed in claim 22, in which the electrically inert molecules are compounds with a long-chain alkyl residue.

24. (new): The circuit element as claimed in claim 23, in which the inert molecules have a head group by means of which they are covalently bonded to the first layer which is composed of the electrically insulating substrate material.

25. (new): The circuit element as claimed in claim 24, in which the inert molecules are alkylsilyl compounds with the general formula

$CH_3$-$(CH_2)_p$-$SiR_1R_2R_3$ (II),

wherein in formula (II) p represents an integer between 1 and 30, and wherein $R_1$, $R_2$ and $R_3$ are selected from the group consisting of hydrogen, halogen, OR', NHR', and NR'R", and wherein R' and R" is equally alkyl.

26. (new): The circuit element as claimed in claim 22, further comprising a plurality of discrete areas which are composed of the first electrically conductive material are embedded in the substrate material and are applied to the substrate material.

27. (new): The circuit element as claimed in claim 22, in which the first electrically conductive material is selected from the group consisting of gold, silver palladium, platinum and silicon.

28. (new): The circuit element as claimed in claim 22, in which the layer which is composed of the second electrically conductive material comprises titanium and aluminum.

29. (new): The circuit element as claimed in claim 22, further comprising the first electrically conductive material and the second electrically conductive material being in the form of electrodes.

Remarks

The purpose of this Preliminary Amendment is to conform to United States Patent and Trademark Office practice and not for the purpose of patentability. No new matter has been added by way of this Preliminary Amendment.

Respectfully submitted,
INFINEON TECHNOLOGIES, AG

By its attorneys
Briggs and Morgan, P.A.

Dated: 9/4/03

By _____
Jeffrey R. Stone (Reg. No. 47,976)
2200 IDS Center
80 South Eighth Street
Minneapolis, Minnesota 55402
Telephone: (612) 977-8560



1556677v1